14. Crew Resource Management

Many professional studies have proven that properly trained team members can collectively perform complex tasks better and make more accurate decisions than the single best performer on the team. Conversely, the untrained team's overall performance can be significantly worse than the performance of its weakest single member. This chapter will cover aspects and attitudes of teamwork and communication among team members.

Crew Resource Management (CRM) was developed by the airlines and later adopted by the U.S. Air Force. Over the years it has gone through several different names and stages. The airlines saw drops in incidents and better crew coordination saw better handling of potential emergencies. The Air Force, and CAP, has recognized this safety concept and over the past several years, aggressively started building programs to protect crewmembers and aircraft.

CRM has evolved to a concept in training and action to get all persons and agencies involved in aviation to help thwart possible accidents. Even now, as CRM is engrained in almost every aspect of aviation, it grows and evolves, becoming better as we make advances.

CAP is a unique organization. Unlike the airlines, where everyone in the cockpit is a rated pilot, CAP has members in the plane who are not pilots. The Air Force is in a similar situation with their crews made up of pilots, engineers, navigators, and loadmasters.

Having scanners and observers who are also pilots is a different situation, as the pilots may want to compete over who is flying the aircraft. They *really* need to work together during flights.

It is essential that everyone in the aircraft feel free to speak up and provide input and ideas; even the crewmember that has only flown once may have the critical idea that could save an entire plane. But remember that the pilot is the final authority for safe operation of the aircraft and will make the final decision.

OBJECTIVES:

1. Discuss the fundamentals of aircrew coordination and CRM. {S; 14.2}
2. Discuss situational awareness. {O & P; 14.3}
3. Discuss how to regain SA once lost. {O & P; 14.4}
4. Describe barriers to communication. {O & P; 14.5}
5. Define and discuss task saturation. {O & P; 14.6}
6. Discuss assignments and coordination of duties. {O & P; 14.8}

14.1 Statistics

CAP	1996	1997	1998	1999	2000
Aircraft accidents	9	5	6	3	1
Per 100,000 hours	7.79	4.16	4.76	2.34	0.94
Aircraft flight incidents	28	27	19	12	16
Aircraft ground incidents	7	8	3	6	8
Fatalities	7	2	3	2	0

While the overall aircraft accidents (as defined by dollar and injury loss) have decreased, the number of flight and ground incidents is up over last year.

Statistics only mean how they are interpreted. We use statistics to show us where we are having problems, which will hopefully help correct those problems. Where do we need to focus our attention? Lets look at some other statistics.

MISHAP	1998	1999	2000
Taxi	9	4	9
Ground	4	6	3
Landing	8	8	10
Other	4	3	2

Taxi mishaps are mishaps where a crewmember was in the aircraft and moving it under aircraft power. All of these are a result of colliding with something, or going off the paved surface into a ditch. Many occurred when more than one pilot was onboard. Here we need to have everyone looking outside whenever the aircraft is moving.

Ground mishaps were due to moving the aircraft with human power, such as pushing or pulling the aircraft in and out of the hanger. Five of these totals were a result of opening or closing a hanger door and hitting the aircraft. These could be avoided with basic situational awareness and teamwork. While moving aircraft by hand or under aircraft power in close proximity to any objects, use wing walkers.

Landing mishaps (constantly high numbers). Due to the phase of flight, these have a potential for great damages to aircraft and injury to personnel.

A critical concept that needs to be enhanced is that, if any crewmember sees a problem or doesn't like the landing situation, they need to call "GO-AROUND." The pilot should then immediately perform a go-around (unless a higher emergency exists). *Every crewmember, pilot or not, has the right and the responsibility to keep themselves alive*. Maybe the scanner in back notices that the main tire is flat -- tell the pilot! Everyone MUST speak out, and the pilot MUST act on it.

Other mishaps. Two of these occurred when two separate crews flew the aircraft out of fuel and crashed. The others were mishaps that were caused in flight by stalling the aircraft for some reason, or reasons that have not been determined by the NTSB.

14.2 Fundamentals

Failures are those of parts and physical objects or how people have failed in their actions or products.

- Mechanical failures involve every possible type of mechanical, part, or environmental failure. Examples are aircraft parts, runway surfaces, lighting, radios, and ATC.

- Human failures occur when people fail to perform the required actions. When a aircraft part fails because the person making the part didn't do it right, that is a human factors failure. Other examples are failures on the part of the pilot, observer, scanner, and ATC.

Error Chain. A series of event links that, when all considered together, cause a mishap. *Should any one of the links be "broken" then the mishap will not occur*. Here is a example of an error chain:

- A mechanic does not properly fix aircraft instrumentation during annual,

- The pilot gets alerted to fly and, in a rush, gets a poor weather briefing,

- The crew misses indications of broken instrument during the pre-flight inspection,

- The pilot enters unexpected (to him) weather and transitions to instrument flying,

- Flight instruments give the pilot bad information and he begins to get disoriented,

- The disorientation leads to a stall and subsequent spin,

- The pilot is unable to recover from the spin and impacts the ground.

All of these are links in the chain. If any one of them could have been stopped or the link broken, the accident would not have happened. *It is up to everyone on a crew to recognize an accident link and break the chain.*

14.3 Situational Awareness

Simply put, situational awareness (SA) is "knowing what is going on around you at all times." SA is not restricted to just pilots -- everyone must exhibit SA at all times. Each crewmember must have their SA at peak levels while flying because it takes everyone's awareness to keep the plane safe in flight. Scanners and observers have their own unique positions and functions that require full attention, so their SA is essential to the safe operation of any CAP flight.

Examples of good SA attitudes are:

- Good mental health, where each crewmember is clear and focused.

- Good physical health. This includes fatigue, sickness, hydration, and stress factors.

- Attentiveness. Keep your attention on the task at hand.

- Inquisitiveness. Always asking questions, challenging ideas, and asking for input.

Examples of SA skills:

- Professional skills developed through training, practice and experience.

- Personal skills such as good communication skills. This is necessary to effectively get your point across, or receive valid input. Interpersonal skills such the basic courtesies factor greatly into how a crew will get along, and this will greatly impact crew effectiveness and performance.

To help prevent a loss of SA, use the IMSAFE guidelines. This checklist was developed for the FAA as a quick memory guide for aviators to run through and make self-determination as to their fitness to fly. If a crewmember says yes to any of these, they really shouldn't fly.

Situational awareness may be lost for many reasons. Five of the more common reasons are:

- Strength of an idea. Someone has an idea so strong and ingrained that they won't listen to anything else. They find it difficult to alter the idea, even with new or conflicting information. The antidote to this is to ask questions or revert to training.

- Hidden agenda. Someone has a personal agenda, but keeps it hidden. Fail to tell others of their intentions. The antidote is to be honest, and to express ideas and intentions.

- Complacency. Someone has done a certain task so often that they forget about the risk. "I've done this a hundred times," or "It won't happen to me." The antidote is to revert to training, and realize that even if you've done it a hundred times before, the one hundred and first can still hurt you.

- Accommodation. Repeated exposure to threats or stress situations will decrease alertness or awareness, which leads to a form of complacency.

- Sudden Loss of Judgment. Something quickly distracts a person and gets their full attention. Whatever they were doing or should be doing is now gone.

Symptoms of loss of SA vary, but a few are:

- Fixation.
- Ambiguity.
- Complacency.
- Euphoria.
- Confusion.
- Distraction.
- Overload.
- Improper performance of tasks or procedures.

Also, look for *hazardous attitudes*:

- Anti-authority (Don't tell me!). The antidote is to follow the rules.
- Impulsiveness (Do something NOW!). The antidote is to slow down and think first.
- Invulnerability (It won't happen to me!). The antidote is to realize that, yes, it can happen to me.
- Macho (**I** can do it!). The antidote is to realize that this attitude can hurt others beside you. This attitude can really be detrimental when there is an experience pilot in both the left and right seat! In this case, it is very important that the two pilots agree on who's flying the aircraft.
- Resignation (What's the use?). The antidote is to realize that you can make a difference, and to ask for help.
- Get There It-us (I've *got* to be home by 5!). Its better to be late than to be dead.

14.4 Overcoming Loss of SA

There are a number of standardized tools that can help improve CRM and overcome a loss of situational awareness. When a crew loses SA it is critical to reduce workload and threats:

- Suspend the mission. [Remember to "Aviate, Navigate and Communicate."]
- Get away from the ground and other obstacles (e.g., climb to a safe altitude).
- Establish a stable flight profile where you can safely analyze the situation.

Once we have lost situational awareness, or recognized the loss in another crewmember, how do we get it back? A few methods are to:

- Listen to your gut feelings. If it acts like an idiot and talks like an idiot, then its probably an idiot.

- *Use terms like "Time Out" or "Abort" or "This is Stupid."* Once terms like these are called, the pilot should terminate the task or maneuver, climb away from the ground if necessary, establish straight-and-level flight and then discuss the problem. [The term you use should be agreed upon before the flight.]

  A good example comes from a CAP training mission departing a controlled airport. As the aircraft was climbing out the scanner spotted traffic and said "Pilot, traffic at three o'clock." The pilot was talking to departure and replied "Quiet, I'm on the radio." The scanner repeated his sighting, and the pilot repeated his reply. The scanner shut up and the pilot finally saw the traffic.

  What happened? The pilot ignored a serious safety input from a crewmember. His action alienated the scanner and established a climate not conducive to safety. [Coincidently, the scanner was a commercial pilot and USAF T-37 instructor with more flying experience than the rest of the crew combined.]

  Be aware that lack of individual respect can cause alienation, which is a serious barrier to communication (see next section) and can shatter teamwork. If an individual is insulted or ignored when making comments they will shut down and stop working with the crew. When this happens the aircrew must solicit input in order to pull the alienated crewmember back into the mission.

- *Keep the cockpit sterile* -- keep talk to the minimum necessary for safety. Particularly important during taxi, takeoff, departure, low-level flying, approach, and landing. This helps remove distractions and keep everyone focused on the important things.

14.5 Barriers to Communication

This section is concerned with the human factors that may act as barriers to effective communication between team members, adversely affecting mission performance. Rank, gender, experience level, age, personality, and general attitudes can all cause barriers to communication. You may occasionally be hesitant to offer an idea for fear of looking foolish or inexperienced. You may also be tempted to disregard ideas that come from individuals that have a lower experience level. If you are committed to teamwork and good crew coordination, you must look through such emotions and try to constructively and sensitively adapt to each personality involved.

You can deal best with personalities by continually showing personal and professional respect and courtesy to your teammates. Criticism will only serve to build yet another barrier to good communication. Nothing breaks down a team effort faster than hostility and resentment. Always offer opinions or ideas respectfully and constructively. Instead of telling the pilot, "You're wrong," tell him what you *think* is wrong, such as "I think that new frequency was 127.5, not 127.9."

Personal factors, including individual proficiency and stress, may also create barriers to good communication. Skills and knowledge retention decrease over time, and that is why regular training is necessary. If you don't practice regularly, you very likely will spend a disproportionate amount of time on normal tasks, at the expense of communication and other tasks. Civil Air Patrol, the FAA, commercial airlines, and the military services all require certain minimum levels of periodic training for the sole purpose of maintaining proficiency.

Stress can have a very significant, negative effect on cockpit communication. An individual's preoccupation with personal, family, or job-related problems distracts him or her from paying complete attention to mission tasks and communication, depending upon the level and source of stress. The flight itself, personalities of the individuals, distractions, flight

conditions, and individual performance can all be sources of communication-limiting stress. When stress reaches very high levels, it becomes an effective barrier to communication and job performance. Many fliers and medical specialists advocate refraining from flying or other complex tasks until the stress is removed.

In an emergency, there will likely be much more stress with which each crewmember must cope. Since very few emergencies result in immediate or rapid loss of an airplane, most experienced aviators recommend making a conscious effort to remain calm, taking the amount of time necessary to properly assess the situation, and only then taking the appropriate corrective action.

Part of your job is also to recognize when others are not communicating and not contributing to the collective decision-making process. Occasionally, other crewmembers may need to be actively brought back into the communication process. This can often be done with a simple "What do you think about that?" In a non-threatening way, this invites the teammate back into the communication circle, and, in most cases, he or she will rejoin the information loop.

14.6 Task Saturation

At times, crews or individual members may be confronted with too much information to manage, or too many tasks to accomplish in the available time. This condition is referred to as *task saturation*. This will most likely happen when a crewmember is confronted with a new or different situation such as an emergency, bad weather, or motion sickness. Preoccupation with the different situation may then lead to a condition of "tunnel vision," where the individual can lose track of many other important conditions. In an advanced state, comprehension is so far gone that partial or complete *situational awareness* is lost. When individuals are task saturated to this extent, communication and information flow usually ceases.

Everyone needs some workload to stay mentally active and alert. The amount of work that any member can handle is directly related to experience level. Each crewmember must try to keep his or her workload at an acceptable level. If you begin to feel overwhelmed by information or the sheer number of things to do, it's time to evaluate each task and do only those tasks that are most important. If you ever feel over-tasked, you have an obligation to tell the other crewmembers *before* becoming task-saturated and losing your situational awareness. If others know your performance is suffering, they may assume some of the workload, if they are able. Once the most important tasks are accomplished and as time permits, you can start to take back some of those tasks that were neglected earlier. Allocation of time and establishing priorities is known as *time management*.

Most people can recognize task saturation and understand how it can affect performance. However, you should also watch for these symptoms in other members of your crew and take over some of their responsibilities if you have the qualifications and can do so without placing your own duties at risk.

The pilot's job is to safely fly the aircraft, and you should be very concerned if he or she becomes task saturated, or spends an excessive amount of his time with tasks other than flying the airplane. No crewmember should ever allow the work management situation to deteriorate to such an extent as to adversely affect the pilot's ability to continue to safely operate the aircraft. Many preventable accidents have resulted from crews' entire involvement in other areas or problems, while the airplane literally flew into the ground. If any crewmember suspects pilot task saturation to be the case, nonessential discussion should cease, and the crew as a whole should discontinue low-priority aspects of the job, and even return to the mission base if necessary.

14.7 Identification of Resources

External resources can be people, equipment, or simply information. Internal resources are primarily training and experience.   Resources are needed for the successful accomplishment of the mission.

Each crewmember must be able to identify the resources available to him or her, determine where the resources can be located when needed, and effectively incorporate those resources into the mission.

14.8 Assignment and Coordination of Duties

Assignment of aircrew duties is based on CAPR 60-3. All flight-related duties are conducted under the supervision of the aircraft commander. Mission-related duties may also be conducted under the supervision of the aircraft commander, but a properly trained observer can also fill the role of mission commander. The key is that positive delegation of monitoring duties is as important as positive delegation of flying duties.

As previously discussed, it is very important for each crewmember to know what they are supposed to be doing at all times and under all conditions. Aircraft safety duties vary with the start up, taxi, takeoff, departure, transit, approach and landing phases of flight. Mission duties are related to the mission objective, primarily to fly the aircraft safely and precisely (the pilot) and to scan effectively (scanners and observers).

Until recently, the study of crew coordination principles was limited to studying flight crew performance. However, over the last decade, the number of preventable operator-caused errors leading to accidents has caused both the military and commercial aviation communities to expand the study focus. Airline and military crew resource training now includes special emphasis and encouragement that, when making decisions, the pilot or aircraft commander should include *all* assets and sources of information in the decision-making process. The general assumption or theory is that as more information becomes available, the likelihood of more accurate decisions will increase and operator errors will be reduced.

The same general principles of crew coordination and resource management apply to all the members of the aircrew team. Incident commanders, planning section chiefs, operations section chiefs, SAR/DR pilots, mission observers, scanners, air traffic controllers, and flight service station personnel should all be considered sources for appropriate information by the aircrew team.

In order for any information to be used, it must be effectively communicated. The effective communication process that leads to good crew coordination actually starts well before a flight begins. Each member must pay close attention during the incident commander briefing to every detail presented. Clear understanding of the "big picture," search objective, altitudes, area assignments, and search patterns to be used *prior* to departure will preclude questions and debate in flight, when other tasks should take higher priority. Crewmembers having questions are encouraged to ask them at this time. The incident commander or air operations officer will normally establish certain safety-related rules for conducting that particular mission.

Decisions and search assignments are normally clearly stated to the crews, and crewmembers are encouraged to offer their own ideas. Planning and briefing officers should answer each question openly and non-defensively, and you should also make every effort to seek complete understanding of each situation.

In developing the actual mission operational plan workload management and task distribution are very important. An over-tasked crewmember may not develop a complete grasp of mission aspects that later may affect his or her performance. Remain alert for over-tasking in other crewmembers, and offer help if possible. If you find yourself over-tasked, do

not hesitate to ask another qualified member for help. Each team member must continually think "teamwork."

Close attention should be paid during the pilot's briefing. The pilot will establish flight-specific safety "bottom lines" at this time, such as emergency duties and division of responsibilities. Each individual must again clearly understand his specific assigned duties and responsibilities before proceeding to the aircraft.

Other phases of the flight also require that distractions be kept to a minimum. Recent air transport industry statistics show that 67% of airline accidents during a particular survey period happened during only 17% of the flight time -- the taxi, takeoff, departure, approach and landing phases. The FAA has designated these phases of flight as critical, and has ruled that the cockpit environment *must* be free of extraneous activity and distractions during these phases to the maximum extent possible (the sterile cockpit).

In assigning scanning responsibilities to the scanners, mission observers must be receptive to questions and suggestions from the scanners. Carefully consider suggestions and understand that suggestions are almost always offered constructively, and are not intended to be critical. Answer questions thoroughly and openly, and don't become defensive. All doubts or questions that you can't answer should be resolved as soon as possible. It is critical to remember that CRM encourages the flow of ideas, but the Mission Pilot must make the final decision based on the crew's input.